EFFECT OF SOIL TYPE AND HYDROLOGY ON THE COMPOSITION OF NITROGEN GASES EMITTED FROM RIPARIAN BUFFERS

Lori Bebinger (Pierre-Andre Jacinthe), Department of Earth Science, Indiana University Purdue University-Indianapolis, Indianapolis, Indiana 46202

The US Corn Belt States are the leading contributors to nitrate (NO_3^-) enrichment and the so-called dead-zone in the Gulf of Mexico. Located at the interface between agricultural fields and surface water bodies, riparian buffers have shown great capacity to remove NO_3^- from agricultural runoff, and thus reduce fertilizer N export to streams. Under the right conditions (organic carbon, moist to wet soils), riparian soil microbes can convert NO_3^- into nitrous oxide (N_2O) and dinitrogen (N_2).However, from an air quality standpoint, a low N_2O production relative to N_2 (mole fraction of N_2O) would be preferred because N_2O contributes to the greenhouse effect and depletion of the ozone layer, With the hypothesis that frequent water saturation is favorable to the reduction of N_2O into N_2 (thus a low N_2O mole fraction), a study was conducted to identify controlling factors of N_2O mole fraction across various riparian buffers, including well-drained (WR), artificially-drained (LWD), and poorly-drained (SF) sites. The relative production of N_2O and N_2 was measured in the laboratory using the acetylene (C_2H_2) block technique. In the absence of C_2H_2, there was no difference in N_2O production rate among the sites. However, in the presence of C_2H_2, N_2O production at SF (30 µg N_2O kg^{-1} soil h^{-1}) was much higher than at the other sites (3.31 at LWD and 8.42 at WR). Conversely, the N_2O mole fraction at SF (0.11) was lower than at WR (0.28). These results are consistent with the greater soil moisture, and higher total soil organic C at SF compared to the other sites. The low N_2O production at LWD is probably due to the presence of tile drains and infrequent soil saturation. Future studies will examine the impact of tile-drain on the composition of N gases from these types of buffers.

Undergraduate Research Opportunity Program